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ABSTRACT

The program and abstracts of the presentations of the 1985 meeting of the Society for College Science Teachers of the National Science Teachers Association (NSTA) are the topics of this report. Society officers are listed, a history of the society is provided, and membership information is given. Committees are listed, with members and chairs. The abstracts from the NSTA convention are listed by the theme areas of: (1) computer applications in science teaching; (2) innovations in chemistry teaching; (3) current concerns in college science teaching; (4) field experiences; (5) innovations in physics teaching; (6) innovations in biology teaching; and (7) scientific literacy. Also included are the abstracts from the eastern and southwestern regional meetings. (JM)

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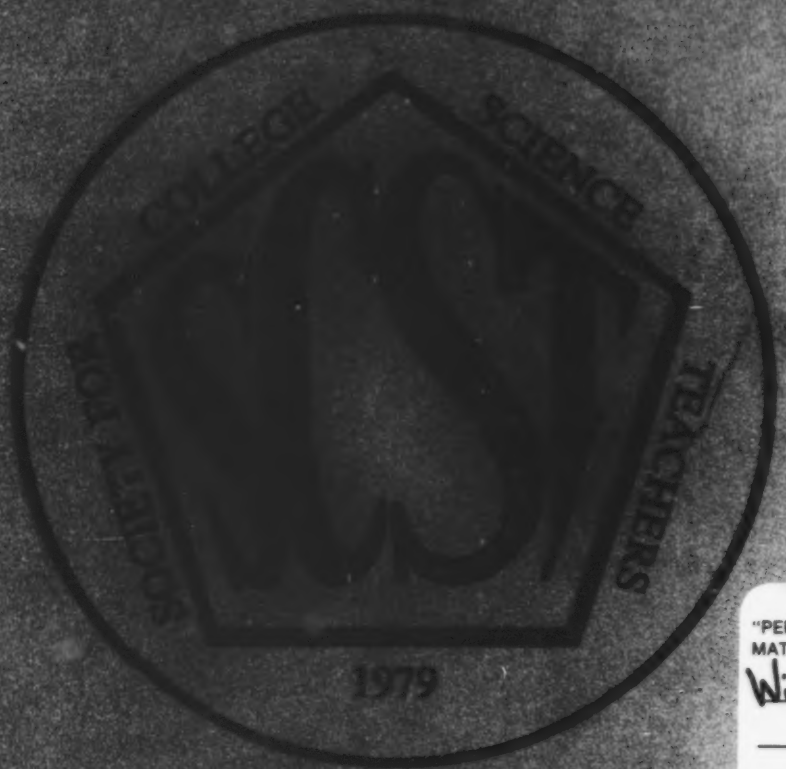
SOCIETY FOR COLLEGE SCIENCE TEACHERS



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Programs and Abstracts

Volume 5 1985

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PROGRAMS AND ABSTRACTS
VOLUME 5 1985

Prepared in the College of Arts and Sciences,
West Virginia University, Michael P. Donovan, editor

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SCST Seeks to:

Provide profession-wide identity for college science teachers.

SCST is the only organization devoted solely to providing an organized identity for college science teachers in all science disciplines.

Promote collective self interest.

SCST is rapidly becoming a major information dissemination source with certain federal agencies and is sought for opinions on college level science instruction.

Improve teaching of science at the college level.

SCST is an open forum for the exchange of ideas, enabling better articulation and transfer, more compatible curricula, new teaching techniques, and improved instruction.

Sponsor projects.

SCST is committed to the organization and sponsorship of practical and worthwhile projects that contribute to excellence in college science teaching.

SCST Offers:

Conferences

During the spring of each year, convention programs and paper sessions are held as partt of the NSTA Annual Convention. These meetings enable college science teachers to communicate with each other and to learn what is happening at other levels of science teaching. Regional and local SCST conferences have been organized for the exchange of ideas and experiences, and discussion of issues of local concern. Local conference highlights are summarized in the SCST Newsletter.

The Journal of College Science Teaching

SCST members receive the JCST which is published by NSTA six times a year. It contains feature articles on issues and topics of interest to college science teachers, new college science approaches, editorials, news items, book reviews, abstracts of selected articles, equipment and new products information, reviews of instructional media, national and legislative perspectives on college science teaching, and advertisements.

SCST Newsletter

The SCST Newsletter provides a regular source of information about Society business, projects, and membership activities. It is a source for keeping up-to-date with the Society and new developments in college science teaching.

To join us in The Society for College Science Teachers clip and mail the coupon

- - - -

SOCIETY OFFICERS

President: Dr. Sterling L. Smith, Biology Department, Texas Woman's University, Denton, TX 76204 (817/566-2907).

Past President: Dr. Robert W. Menefee, Dean of Science and Mathematics, Germantown Campus, Montgomery College, Germantown, MD 20874 (301/972-2000).

President-Elect: Dr. Marjorie Gardner, Director, Lawrence Hall of Science, Berkeley, CA 94720 (415/642-4193).

Secretary-Treasurer: Dr. William M. Frase, University College, M.L. 47, University of Cincinnati, Cincinnati, OH 45221 (513/475-3551).

Councilors-At-Large: Dr. Orin G. Gelderloos, Department of Natural Sciences, University of Michigan-Dearborn, Dearborn, MI 48128.

Dr. Eleanor D. Siebert, Department of Physical Sciences and Mathematics, Mount St. Mary's College, 12001 Chalon Road, Los Angeles, CA 90049.

Membership Chair: Dr. Theodore Lopushinsky, Department of Natural Sciences Room 100 North Kedzie Lab, Michigan State University, East Lansing, MI 48824 (517/355-4600).

NSTA President: Alice J. Moses, University of Chicago, The Laboratory Schools, Chicago, IL 60637 (312/962-9444).

HISTORY OF THE SOCIETY

The Society for College Science Teachers (SCST) was established on March 24, 1979. The need for such an organization was identified by a group of concerned individuals within the National Science Teachers Association (NSTA). Significant to their concerns was a lack of a forum through which college science teachers could interact in an interdisciplinary manner with their colleagues from other institutions. With the establishment of the SCST, an essential prerequisite for addressing identified needs became available to the profession.

In April, 1981, the SCST became an official affiliate of the NSTA. The merger provides for increased services for college science teachers in assisting them to reach their personal objectives as well as those of the profession.

In recognition of the importance of local area efforts to whatever success SCST may achieve, twenty working committees were established in 1982 in order to provide for increased program direction as well as for increased member participation.

With the membership of SCST now approaching 700, plans are underway to divide SCST into several geographic regions in order to facilitate program development and implementation between the national and local structures.

The goals of the SCST include:

A. Promotion of a societal and cultural awareness of the significance of science to the modern world,

B. Provision of a profession-wide identity for college science teachers,

C. Improvement in the teaching of college science courses via interdisciplinary interactions among college science teachers,

D. Promotion of collective self-interest,

E. Sponsorship of appropriate projects such as local and regional conferences and workshops.

State Membership Chairpersons

Several States lack membership chairs. To volunteer to serve your state contact Ted Lopushinsky, Department of Natural Sciences, Michigan State University, East Lansing, MI, 48824, (517) 355-4500.

Alabama:	Mary Ann Higgs-Brown, Troy State University System, Dothan/Fort Rucker Campus, Box 6947, Dothan, AL 36302
Alaska:	N/A
Arizona:	N/A
Arkansas:	Leo Bowman, Arkansas Technical University, Russellville, AR 72801
California:	Theresa Ann Thomas, Southwestern College, 900 Otay Lakes Road, Chula Vista, CA 92010 Eleanor D. Siebert, Mount St. Mary's College, 12001 Chalon Road, Los Angeles, CA 90049
Colorado:	N/A
Connecticut:	Eleanor Wesloh, Sacred Heart University, Park Ave. & Bridgeport, Bridgeport, CT 06605
Delaware:	William J. McIntosh, Science Education, Delaware State College, Dover, DE 19901
Florida:	Elizabeth Hays, Division of Biological and Biomedical Sciences, 1300 NE 2nd Avenue, Barry University, Miami Shores, FL 33161
Georgia:	Rebecca A. Halyard, Clayton Junior College, Box 285, Morrow, GA 30260 Brooke M. Pridmore, Clayton Junior College, PO Box 285, Morrow, GA 30260
Hawaii:	N/A
Idaho:	Frank Stark, 10420 Whispering Cliffs Drive, Boise, ID 83704
Illinois:	N/A
Indiana:	Walter Cory, 108 Memorial Hall West, Indiana University, Bloomington, IN 47401
Iowa:	N/A
Kansas:	N/A
Kentucky:	N/A
Louisiana:	N/A
Maine:	N/A
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Massachusetts:	Edwin A. Boger, Worcester State College, 486 Chandler Street, Worcester, MA 01602
Michigan:	Marion Whittaker, Delta College, University Center, MI 48710
Minnesota:	N/A
Mississippi:	Johnny L. Mattox, Northeast Mississippi Junior College, Cunningham Boulevard, Booneville, MS 38829
Missouri:	N/A
Montana:	N/A

Nebraska:	N/A
Nevada:	N/A
New Hampshire:	N/A
New Jersey:	N/A
New Mexico:	N/A
New York:	Nathan Dubowski and Elliott M. Hartman, Jr., Westchester Community College, 75 Grasslands Road, Valhalla, NY 10595; Ronald S. Payson, Columbia Greene Community College, Box 1000, Hudson, NY 12534
North Carolina:	Charles Ward, University of North Carolina at Wilmington, Wilmington, NC 28406
North Dakota:	N/A
Ohio:	Janet Tarino, Ohio State University, Mansfield Campus, 1680 University Drive, Mansfield, OH 44906
Oklahoma:	Michael H. Gipson, Oklahoma Christian College, Route 1, Box 141, Oklahoma City, OK 72311
Oregon:	N/A
Pennsylvania:	Andrew C. Brose, Indiana University of Pennsylvania, Indiana, PA 15705
Rhode Island:	N/A
South Carolina:	David Stroup, 330 Long Hall, Clemson University, Clemson, SC 29631
South Dakota:	E.H. Coker, University of South Dakota, Vermillion, SD 57069
Tennessee:	Patrick J. Doyle, Middle Tennessee State University, Murfreesboro, TN 37132
Texas:	N/A
Utah:	N/A
Vermont:	N/A
Virginia:	James J. MacDougall, Tidewater Community College, 1428 Cedar Road, Chesapeake, VA 23320
Washington:	N/A
West Virginia:	Michael Donovan, West Virginia University, Morgantown, WV 26505
Wisconsin:	Linda Mallick, Viterbo College, 815 S. 9th Street, LaCrosse, WI 54601 Roxine E. McQuinty, 4633 W. Fond du Lac, Milwaukee, WI 53216
Wyoming:	Dick W. Birkholz, Sheridan College, Sheridan, WY 82801
Canada:	R. J. Doyle, University of Windsor, KWindsor, Ontario, Canada, N9B 3P4; Michael A. Holmwood, 100 W. 49th Street, Vancouver, British Columbia, Canada, V5Y 2Z6
Puerto Rico:	Marcelina Velez de Santiago, Catholic University of Puerto Rico, Ponce, Puerto Rico 00731
Washington, DC:	N/A

SCST Standing Committees and Committee Chairs

Awards Committee:

Paul M. Shaver, Swift Street, Oswego, NY 13126

Committee on Academic-Industrial Communication and Cooperation:

Harold T. McKone, Chemistry Department, St. Joseph College, West Hartford, CT 06117, (203) 232-4517.

Committee on Advanced Undergraduate Courses:

Jeannette S. Mullins, Biology Department, California State College, California, PA 15419.

Committee on Handicapped College Science Students:

Ian Brindle, Department of Chemistry, Brock University, St. Catharines, Ontario, Canada L2S3A1, (416) 688-15550.

Committee on Introductory College Science Courses:

Ruth Fleishman, Biology Department, Skidmore College, Saratoga Springs, NY 12866, (518) 584-5000.

Committee on Issues and Public Affairs:

Jon R. Hendrix, Biology Department, Ball State University, Muncie, IN 47306.

Committee on Non-Sciences Majors Courses:

Maura Flannery, St. Johns University, Jamaica, NY 11439
and
Helen Koritz, College of Mt. St. Vincent, Riverdale, NY 10471

Committee on Science and Technology:

E. Joseph Piel, (Department of Technology and Society, College of Engineering and Applied Sciences, State University of New York at Stony Brook, Stony Brook, NY 11794.

High School/College Articulation Committee:

Robert E. Burge, 413 Huntington Road, Garden City, NY 11530.

International Committee:

Joseph S. Schmuckler, Temple University, Philadelphia, PA 19122.

Liaison Committee:

Marvin Druger, Department of Biology, Syracuse University, Syracuse, NY 13210.

Placement Information Services Committee:

Charles R. Ward,, Department of Chemistry, University of North Carolina at Wilmington, Wilmington, NC 284406, (919) 395-3452.

Research in College Science Teaching Committee:

John Penick, Science Education Center, University of Iowa, Iowa City, IA 52242, (319)353-4506.

Resource and Development Committee:

Orin G. Gelderloos, University of Michigan - Dearborn, 4901 Evergreen Road, Dearborn, MI (313)593-5338.

PROGRAM

SOCIETY FOR COLLEGE SCIENCE TEACHERS

NSTA CONVENTION - APRIL 18-21, 1984, CINCINATTI

SCST President: Sterling Smith

Thursday, April 18
3:00 PM - 5:00 PM
STEERING COMMITTEE MEETING
Board of Governors Room, Hyatt Hotel

Friday, April 19
3:30 PM - 5:00 PM
ANNUAL BUSINESS MEETING
Salon M, Netherlands Plaza

5:00 PM - 6:00 PM
SCST SOCIAL - WINE AND CHEESE
Salon M, Netherlands Plaza

CONTRIBUTED PAPER

All sessions will be held in
Salon E, Netherlands Plaza

COMPUTER APPLICATIONS IN SCIENCE TEACHING

Friday, April 19,
8:00 AM-9:00 AM

Presider: Robert Menefee, Montgomery College, Germantown, Maryland

Interactive Videodisc/Computer Learning Programs for University General Biology

William Leonard, Department of Zoology and Physiology, Louisiana State University, Baton Rouge, LA.

Using Computer Assisted Instruction to Strengthen Biology for Non-Majors

William Cavenee, Department of Science-Math, Central Arizona College, Coolidge, AZ.

Making the Most of Commercially-Produced Microcomputer Software

Rebecca Halyard, Department of Biology, Clayton Junior College. Morrow, GA.

Simulation of Acid-Base Balance Using the Microcomputer

Andrew Browe, Department of Biology, Indiana University of Pennsylvania, Indiana, PA.

COMPUTER APPLICATIONS IN SCIENCE TEACHING

Friday, April 19
9:15 - 10:15 AM

Presider: Joel Berger, Educational Studies, College of Staten Island. CUNY, Staten Island, NY.

A Program for Excellence in Science, Mathematics and Computer Education

R.D. Bowman and M. Betkouski, Departments of Natural Sciences and Science Education, University of North Florida, Jacksonville, FL.

Data-Base Computer Program: Learning Data Analysis in an Ongoing Undergraduate Research Project

Angelo Sauro, Department of Biology, Mount Mary College, Milwaukee, WI.

Laboratory Computers--How Should They Be Used?

Fred Thomas and Conrade Hinds, Department of Physical Science, Sinclair Community College, Dayton, OH.

INNOVATIONS IN CHEMISTRY TEACHING

Friday, April 19
1:00 - 2:00 PM

Presider: Ronald Watras, Department of Science, Anne Arundel Community College, Annapolis, MD.

Humor and Humanism as Spice for Science Lectures

Eunice Bonar, Department of Chemistry, University of Texas at Arlington, Arlington, TX.

Demonstrating Chemical Evolution - A Simple Procedure

Nathan Dubowsky and Elliott Hartman, Department of Biology & Physical Sciences, Westchester Community College, Valhalla, NY.

A Secondary-College Chemistry Articulation Program

Cullen Johnson and Irene Heller, Department of Chemistry, Cuyahoga Community College and North Olmsted High School, Parma, OH.

The Effects of Teaching an Information Processing Problem Solving Approach on the Achievement of College Chemistry Students

Diane M. Bunce, University of Maryland, College Park, MD.

INNOVATIONS IN CHEMISTRY TEACHING

Friday, April 19
2:15 - 3:15 PM

Presider: Marjorie Gardner, Lawrence Hall of Science, Berkeley, CA.

Teach Them Reasoning - Not Algorithms

John Ricketts, Department of Chemistry, DePauw University, Greencastle, IN.

A Syllabus for the One Semester Chemistry Course for Health Professions

Jerry Sarquis, Department of Chemistry, Miami University, Miami, OH.

Final Exam Grades and Order of Exam Administration

Charles Ward, Department of Chemistry, University of North Carolina, Wilmington, NC.

Preparing a Grant Application: Do You Really Have to Follow Directions?

Harold McKone, Department of Chemistry, Saint Joseph College, West Hartford, CT.

CURRENT CONCERNS IN COLLEGE SCIENCE TEACHING

Friday, April 19
3:30 - 4:30 PM

Presider: Glan Gupta, Department of Natural Sciences, University of Maryland, Princess Anne, MD.

To Text or Not to Text?

Sherry Anderson, Department of Natural Sciences, Castleton State College, Castleton, VT.

Why Reinforce Misconceptions?

Marion Iona, Department of Physics, University of Denver, Denver, CO.

Practical Methods for Training College Science Tutors and TA's--A "Make and Take" Workshop

John Wilson, Science Education Center, University of Iowa, Iowa City, IA.

FIELD EXPERIENCES

Saturday, April 20
8:00 - 9:00 PM

Presider: Sterling Smith, Texas Women's University, Denton, Texas.

Maximizing Geology Field Experiences

Linda Crow, Earth Science Department, Houston Community College, Houston, TX.

Field Experiences for Non-Science Students

Theodore Lopushinsky, Department of Natural Sciences, Michigan State University, East Lansing, MI.

Alverno's Assessment Model as Applied to the Sciences

Leona Truchan, Wendell Kringen and George Gurria, Natural Sciences and Technology Division, Alverno College, Milwaukee, WI.

Environmental Science and Environmental Studies Programs: What Our Graduates Think of Us

Orin G. Gelderloos, University of Michigan - Dearborn, Dearborn, MI.

INNOVATIONS IN PHYSICS TEACHING

Saturday, April 20
9:15 - 10:15 AM

Presider: Brooke Pridmore, Natural Sciences and Mathematics Department, Clayton Junior College, Morrow, GA.

Physical Science for Business Majors

James Philips, William Rybolt and Lance Heiko, Department of Math/Science, Babson College, Babson Park, MA.

Laboratory and Demonstration Facilities for Solar Energy

Ronald Cosby, Department of Physics and Astronomy, Ball State University, Muncie, IN.

Physics Demonstration

Jerry Wilson, Department of Science and Mathematics, Lander College, Greenwood, SC.

Conceptual Physics First

Paul Hewitt, Department of Physics, City College of San Francisco, San Francisco, CA.

INNOVATIONS IN BIOLOGY TEACHING

Saturday, April 20
1:00 - 2:00 AM

Presider: Leonard Simons, Biology Department, Elmira College, Elmira, NY.

Diagnosis of Student Errors in Diffusion and Osmosis Problems

Robert Allen and Michael Donovan, Department of Biology, West Virginia University, Morgantown, WV.

Relationships Between Piagetian Intellectual Levels and Students' Approaches to Solving Genetics Problems

Michael Gipson, Department of Biology, Oklahoma Christian College, Oklahoma City, OK.

Is the Final Grade in College Biology a True Measure of Student Knowledge?

Thomas Lord, Department of Biology, Burlington County College, Pemberton, NJ.

Managing the Mastery-Based, Individualized Laboratory

William Mullin, Department of Biology, University of New Brunswick, Fredericton, New Brunswick, Canada.

INNOVATIONS IN BIOLOGY TEACHING

Saturday, April 20
2:15 - 3:15 PM

Presider. Rosalyn Hammond, Science Education, Morgan State University, Baltimore, MD.

The Hay Infusion: A Unified Series of Laboratory Exercises in Freshman Botany

Jeanette Mullins and Jan Balling, Biological and Environmental Sciences, California University of Pennsylvania, California, PA. and John Novak, Science and Mathematics Education, Ohio State University, Columbus, OH.

Interactions of Microscopic Soil Organisms: A Laboratory Exercise for Life Science Students

S.M. Paracer, Department of Natural Sciences, Worcester State College, Worcester, MA, and R.P. Esser, Division of Plant Industry, Florida Department of Agriculture, Gainesville, FL.

The Rule-Assessment Technique: Determining Students' Strategic Knowledge

David Maloney, Department of Physics, Creighton University, Omaha, NE.

SCIENTIFIC LITERACY

Sunday, April 21
8:00 - 9:00 AM

Presider: William Frase, University of Cincinnati, Cincinnati, OH.

The Case for Teaching Science Majors and Non-Majors Separately

Maura Flannery, Division of Computer Science, Mathematics and Science, St. Johns University, Jamaica, NY.

How to Motivate Non-Science Majors to Take Science Courses

Babu George, Department of Chemistry/Physics, Sacred Heart University, Bridgeport, CT.

Developing a Curriculum for Scientific and Technological Literacy: A Progress Report

James Murphy, Academic Development in Science and Technology, Iona College, New Rochelle, NY.

History of Science as a Tool in Teaching Science to Non-Science Majors

Richard Seltin, Department of Natural Science, Michigan State University, East Lansing, MI.

Diagnosis of Student Errors in Diffusion and Osmosis Problems.

Robert D. Allen and Michael P. Donovan
West Virginia University
Morgantown, WV

The concepts of diffusion and osmosis are the basis of explanation for a variety of biological phenomena. Most students, however, experience serious difficulty in applying these concepts to biological problems. Using detailed written exercises and individual interviews, we have identified some common difficulties in student problem-solving procedures.

In a typical problem about solute or water fluxes across a biological membrane, students most frequently fail to recognize the dynamics of the process. Rather than analyzing the one-way fluxes, they attempt to base their reasoning only on net fluxes. Many students fail to recognize that there is one-way flux from an area where concentration is low to an area where concentration is high and that there is still movement of material in both directions at equilibrium. These failures make it impossible for them to understand many physiological processes.

We have designed problem exercises which address these difficulties. We require students to graph both the one-way fluxes and the net flux as functions of time. These exercises quickly reveal student difficulties which can then be addressed specifically by the instructor.

To Text or Not to Text?

Sherry Anderson
Castleton State College
Castleton, VT

Each year at this time college professors are being deluged with advertising material from text publishers describing perfect texts for the professor's perfect course. There are a plethora of texts from which to choose in support of a first year college chemistry course. The strengths and weaknesses of these texts are examined. A case is built for not using a single supporting text. A no text general chemistry course at Castleton State College is described and evaluated.

Humor and Humanism as Spice for Science Lectures

Mrs. Eunice Bonar
University of Texas at Arlington
Arlington, TX

Interesting stories of scientists' lives and laboratory research can enliven a lecture and increase the pleasure of learning. Anecdotes and humorous incidents remind us that notable scientists are just as human as those of lesser importance. Wohler and Liebig displayed keen wit in their publication on fermentation which disputed the theories of Pasteur. Bunsen, known best for his laboratory burner, was a personable, humanistic professor. His keen sense of humor endeared him to his students. Dalton was color blind and, thus, another name for this malady is "daltonism". Many little known stories which can be used as spice in science lectures are related in this paper.

A Program for Excellence in Science, Mathematics and Computer Education

R.D. Bowman and M. Betkouski
University of North Florida
Jacksonville, FL

The University of North Florida established a Program for Excellence in Science, Mathematics and Computer Education. The program serves as a resource to promote excellence at elementary, secondary and postsecondary levels in Baker, Bradford, Clay, Duval, Flagler, Nassau, Putnam, St. Johns and Union counties.

The first of the three components which make up the program features immediate response task forces of natural scientists, mathematicians, computer experts and educators trained in these disciplines. The task forces of university and industry experts travel to local schools on request to meet special needs requiring advanced level expertise.

The second component features an ongoing response to the need for computer software in science, mathematics and general computer education techniques. A phone line based software distribution system was established through which any school may obtain public domain software at no charge merely by dialing an electronic library at UNF. The software collection is cataloged and critiqued for maximum user utility.

The third component of the program features a long range response to the need for instructional research and curriculum development to insure that modern knowledge and techniques are used to greatest advantage in teaching science, mathematics and computer skills. The ultimate goal is to refine the instructional delivery system and to incorporate viable learning theory and current technology so that educational excellence is achieved.

There are approximately 175,000 students and 225 schools in the nine counties served by the project. About 675 teachers are directly affected by the program. At least 25,000 students are served indirectly.

Simulation of Acid-Base Balance Using the Microcomputer

Dr. Andrew C. Browe
Indiana University of Pennsylvania
Indiana, PA

This presentation will involve a description and demonstration of a microcomputer (microsoft basic) simulation of acid-base balance in humans. The simulation model is based upon the following assumptions:

1) that the principal buffer is intracellular protein.

2) that the bicarbonate in the plasma comes from carbon dioxide and that all intracellular chloride ions come from the extracellular fluid during the chloride-bicarbonate shift.

3) that there is an unlimited supply of carbon dioxide and water but supplies of chloride and protein are limited.

4) that regulation of acid-base balance is based upon either fast respiratory mechanisms or slow renal mechanisms.

5) that the sensor for the respiratory regulation is arterial pH and pO_2, and medullary pH.

6) that the sensor for the renal regulation is the arterial pH.

The program allows the individual to create any acidotic (metabolic or respiratory) or alkalotic (metabolic or respiratory) condition by altering the arterial pH, pCO_2, and/or HCO_3^- levels. The program then provides for the compensatory mechanisms involving buffers, respiratory, and renal systems for each condition. The program monitors the pH, pCO2, HCO_3^-, protein, of arterial blood and urine volume and pH during the compensation.

The Effects of Teaching an Information Processing Problem Solving Approach on the Achievement of College Chemistry Students

Diane M. Bunce
University of Maryland
College Park, MD

Students in an introductory chemistry course were taught a problem solving approach which was based on the finding of information processing psychologists. This approach was presented in lecture and reinforced in discussion sections as a complete and explicit analysis of mathematical chemistry problems. The control group was taught dimensional analysis as its only problem solving approach. Mathematical chemistry achievement scores and content scores for both the treatment and control groups were compared during the semester. No overall significant difference was found in mathematical chemistry or chemistry scores between the two groups. However, in instances where a high percentage (49%) of students in the treatment group showed written evidence of having used the explicit problem solving approach, significantly higher mathematical chemistry scores were recorded for the treatment group.

Using Computer Assisted Instruction to Strengthen Biology for Non-Majors

William L. Cavenee
Central Arizona College
Coolidge, AZ

Using a self-authoring program E.A.S.E. a series of Biology Highlight computer programs were written to assist the Biology 100 student in grasping the key terms and concepts contained in the textbook and laboratory guide. The basic responsibility for subject matter coverage/mastery was shifted to the student--since the C.A.I. material was available for students in an open computer lab. This approach allowed for flexibility in lecture/discussion sessions, i.e., in-depth coverage of certain high-interest topics while students individually covered the whole chapter via the C.A.I. material. After three semesters in use, the following conclusions concerning the effectiveness of C.A.I. emerged:

1. All students enjoyed the exposure to computers.
2. There exists a positive correlation between time spent in the computer lab and the final grade in the course.
3. General student performance remained at approximately the same level as without C.A.I.
4. The C.A.I. materials aided the moderate to high-ability students most; it appeared to be of little help to low-ability students.

Laboratory and Demonstration Facilities for Solar Energy Education at Ball State University

Ronald M. Cosby
Ball State University
Muncie, IN

The Center for Energy Research, Education, and Services (CERES) at Ball State University has specialized laboratory and demonstration facilities for solar energy instruction and research. A "patio laboratory" consists of more than three thousand square feet of outdoor space adjacent to a long rectangular indoor laboratory space. In addition to providing a convenient site for short duration outdoor student solar experiments, the eight station lab permits long term student testing of solar energy systems. Solar collection devices are situated outdoors while other system components and monitoring instrumentation are operated in the indoor lab. Direct gain and thermal mass wall passive solar systems with sun control elements are included in the patio lab design as demonstration and instructional elements.

An "allweather" laboratory demonstrates the concepts of attached sunspaces and movable insulation while providing a protected environment for selected student solar energy experiments. Finally, an instrumented active solar thermal system with 600 square feet of evacuated tube collectors, thermal storage tanks, and heat transfer equipment provides hands-on laboratory experience for advanced students. The active system also serves as a highly visible demonstration system for other students and visitors and supplies a portion of the space heating, cooling, and hot water needs of the building.

Maximizing Geology Field Experiences

Linda W. Crow
Houston Community College System
Houston, TX

Field experiences in geology are always needed to allow the students to see geological phenomena in a natural, realistic setting. However, some of the benefits of these field experiences are often lost because students do not know what to look for and how to use the information gathered in these natural situations.

This paper describes a system that prepares students for these experiences, and also provides an avenue for applying this information. The system involves an intensive introduction to the field work prior to the actual trip, and a group assignment during the actual field trip. This method has provided an easy way for students to really reap the benefits of these field experiences.

Demonstrating Chemical Evolution - A Simple Procedure

Nathan Dubowsky & Elliott Hartman
Westchester Community College
Valhalla, NY

Most introductory biology and geology courses include a lecture unit on the chemical evolution of life. Unfortunately traditional demonstrations of the initial process, the synthesis of organic molecules from inorganic molecules believed to have been present on the prebiotic Earth, have been avoided because the apparatus is expensive and difficult to contruct. We will demonstrate the construction and operation of a simple and inexpensive "set up" in which simple organic molecules are synthesized under hypothesized prebiotic terrestrial conditions.

The Case for Teaching Science Majors and Nonmajors Separately

Maura C. Flannery
St. John's University
Jamaica, NY

In introductory science courses, it is often simpler and less costly to teach science majors and nonmajors in the same class. This approach may have the added advantage of allowing for an exchange of views between those committed to scientific careers and those whose interest in science is often minimal. These advantages are more than counterbalanced, however, by the advantages of teaching these groups separately. Their levels of preparation and interest are so different that mixing them poses severe problems for a teacher in deciding how to approach the subject matter. Majors must be provided with a firm foundation for future coursework; they must be given more information, more extensive exploration of concepts, than would nonmajors. For the latter group, an introductory course may be one of their few formal contacts with science. They must have the opportunity to develop, in a short time, a feeling for science that majors can develop more gradually. They must be taught to critique media presentations of science, since these will probably be their sole sources of science information in the future. In my presentation, I plan to further explore this issue and to provide further reasons why these groups deserve separate attention.

Environmental Science and Environmental Studies Programs: What Our Graduates Think of Us.

Orin G. Gelderloos
University of Michigan-Dearborn
Dearborn, MI

As part of an evaluation of our Environmental Science and Environmental Studies programs (which included review by outside consultants) our graduates were surveyed. Current positions held by graduates were highly diverse. Few went directly into graduate studies but a majority intend to obtain a graduate degree. Alumni responded that courses which provided quantitative field and laboratory skills and writing skills were most helpful to them in their current position. Information about a unique course (Environmental Instrumentation and Analysis) in our curriculum will be available. The required internship was rated as "extremely valuable" by 90% of the graduates. Methods by which the program was reviewed will also be presented.

How to Motivate Non-Science Majors to Take Science Courses

Babu George
Sacred Heart University
Bridgeport, CT

The author's experience with non-science courses such as Chemistry for the Artist, Consumer Chemistry, Environmental Chemistry, Forensic Chemistry, etc. will be discussed along with practical and some controversial suggestions to attract and keep non-science majors interested in the sciences.

Relationships between Piagetian Intellectual Levels and Students' Approaches to Solving Genetics Problems

Michael H. Gipson
Oklahoma Christian College
Oklahoma City, OK

Michael Abraham
University of Oklahoma
Norman, OK

Since few studies to date have addressed the reasons for the difficulties students experience in working basic Mendelian genetics problems, the purpose of this study was to attempt to identify relationships between the intellectual levels of the students and the difficulties they experience solving genetics problems.

One hundred and fifty general biology students at Oklahoma Christian College were taught a unit in Mendelian genetics by a traditional lecture method. Students were given a unit test and a content validated post-test that required proportional, combinatorial, and probabilistic reasoning in identifying gamete formations and zygote combinations. All students were given the Lawson test for Piagetian intellectual development; seventy-one were given Piagetian interview tasks for proportional, combinatorial, and probabilistic reasoning.

Mean scores on the post-test showed significant differences among the concrete, transitional, and formal thinkers in each of the three kinds of reasoning. Pearson correlation coefficients for the unit test, post-test, Lawson test, and Piagetian interview tasks showed positive association between all variables correlated.

Results of this study indicate that concrete-operational students memorize problem solving techniques rather than understand the formal concepts necessary in genetics studies. Implications for the instruction of genetics in both secondary schools and colleges will be discussed.

Making the Most of Commercially-Produced Microcomputer Software

Rebecca A. Halyard
Clayton Junior College
Morrow, GA

Commercial software for the microcomputer is becoming available in greater quantity and diversity than ever before. Many programs are oriented toward the college-science class room and offer the promise of more efficient, if not increased, student learning.

Review of commercial software programs frequently reveals deficiencies in one or more critical areas (i.e. technical quality, instructional quality, etc.). The software might, however, have overall merit because of high ratings in other areas (i.e. subject matter). Writing an entirely new program without these deficienies is often impossible due to lack of time and/or expertise. Similar commercial programs of more consistent high quality might also be unavailable.

In this presentation a strategy will be given for overcoming some deficiencies of commercial software and making the available materials more useful for individual instructors and students. The strategy is based on identifying specific deficiencies during the software evaluation, and then developing supplemental activities. Examples will be shown using biology software of several types.

Conceptual Physics First

Paul G. Hewitt
City College of San Francisco
San Francisco, CA

We say that physics is the basic science, yet we traditionally teach biology, then chemistry, and lastly (if at all) physics. The order is completely reversed. This is because physics courses are traditionally courses in applied mathematics. If physics were taught as conceptually as biology, and biology were taught as a problem-solving course, the order would be the other way around. Physics <u>can</u> be taught conceptually, and when done this way in the 10th grade can easily be the foundation for a better understanding of chemistry and biology in follow-up courses, and be the most popular science course in high school. I will show how this can be done.

Why Reinforce Misconceptions?

Mario Iona
University of Denver
Denver, CO

It is peculiar that many textbooks at all levels, even including the college level, present material that reinforces students' misconceptions. This is not only at the 'general science' level of courses but also in some texts for majors. Although some authors defend this on general grounds it is also done in specific instances. Their argument is "that it is easier to teach it that way". One wonders whether these misconceptions are also the author's, especially when they appear in second editions or rewritten books. Examples, primarily from college texts, will be presented and analyzed. Typical examples are the beliefs that work has to be done to stop a car; that electroscopes measure charge on the object to which they are connected; that the highest probability to find the electron of the hydrogen atom in a volume element of given size is approximately at the Bohr radius.

A Secondary-College Chemistry Articulation Program

Cullen Johnson & Irene Heller
Cuyahoga Community College - North Olmsted High School
Parma, OH

As a project during the 1982-83 and 83-84 academic year, Cuyahoga Community College - Western Campus Chemistry Department sponsored an articulation workshop for Western Cuyahoga County High School chemistry teachers. The secondary - college chemistry articulation program scheduled workshops for secondary chemistry teachers to become familiar with equipment not normally found in a high school chemistry laboratory. These workshops were followed up with the teachers bringing their chemistry classes to the college to work on the equipment. The experiments were selected by the high school chemistry teachers working with college personnel. Before the students came to the college, they participated in orientation sessions to become familiar with the equipment through the use of slides, tapes and lectures provided by the high school teachers. This paper will discuss the outcomes of the project and suggest future directions.

Interactive Videodisc/Computer Learning Programs for University General Biology

William H. Leonard
Louisiana State University
Baton Rouge, LA

The Annenberg Foundation and the Corporation for Public Broadcasting awarded a major grant to the University of Nebraska to develop alternatives to the traditional lecture/laboratory mode for college biology instruction. The result was two high technology and interactive biology lessons using laser-videodisc player linked to a microcomputer. With this system the videodisk and player provides an extensive library of quality video materials, including motion sequences. The microcomputer provides access to the videodisc, as well as feedback and evaluation of user responses.

One lesson, "Respiration", was designed as a simulated alternative to a popular laboratory investigation which studies the effects of temperature on the respiration rate of three widely different organisms. Students are asked to plan an experiment, manipulate variables, and take actual data from video sequences of a respiring frog, mouse and pea seedling. Tutorial loops and branching depending upon individual experiences and preferences are provided. The second lesson, "Climate and Life", is a simulation of a visit to the ten major biomes of the world, plus an invitation to interact with climatic and biotic data for these biomes. It provides an experience to the student somewhere between a conventional paper-and-pencil biome "laboratory" exercise and the actual visit to ten major biomes.

Field Experiences for Nonscience Students

Theodore Lopushinsky
Michigan State University
East Lansing, MI

At a time when science students have too few academic experiences in the field, it may be questioned why such a course for nonscience students. If the laboratory experience is at the center of understanding of science for science majors, then what better approach to follow with the nonscientist?

The knowledge gained from several years experience with a geology and ecology field course designed for the nonscientist provides the data base for this presentation. A comparison between the on-and off-campus course will be made regarding course design, subject content and student evaluations. Also discussed will be the data pertaining to the specifics involved in course selection, student selection, logistics and costs. The Canadian Rockies, Caribbean and Hawaiian Islands are the areas under discussion.

Is the Final Grade in College Biology a True Measure of Student Knowledge?

Dr. Thomas R. Lord
Burlington County College
Pemberton, NJ

Students today seem more interested in grades than they are in knowledge. It's not uncommon for a class member to ask what minimally must be done for an "A" or if he/she can do an "extra credit" report for the few additional points needed to reach 90 percent. So important are grades that elaborate and often sophisticated cheating means are devised by students. The blame, however, does not rest solely with the students. Employment or postgraduate potentials often hinge on ones GPA.

Too often, however, the final grade is not an honest reflection of a student's knowledge of the subject. On many college campuses success or failure in a course is determined by how well a student did on one or two tests taken over the semester. Some classes may require an additional term paper or include attendance in the evaluative scheme but very few professors attempt to measure insightful, intuitive and creative thinking and skill achievement in the life science.

The life sciences are as much a part of the problem as the other disciplines. Read (1978) found that although over half the time each week was spent in the biology laboratory, the bulk of the grades for the course were based on classroom presentations. The practical, hands on, manipulative skills learned in the lab were rarely tested. Contemporary classrooms are so stuck in the traditional verbal-analytical approach to learning that the practicability and ramification of the subject matter is of little concern. This problem has led many teachers to call for a revamping of contemporary educational curricula.

This study was designed to find if the final grades in college biology were a true measure of student knowledge. One hundred and twenty undergraduates were randomly divided into either a control, placebo, or experimental group. The control group followed a traditional biology scheme of two lectures, one lab, and one seminar each week, the placebo group followed the same scheme but, in addition, was treated to a 30 minute presentation on the historical significance of the lab. Following the same weekly scheme the experimental group was treated to a 30 minute interaction shown to successfully develop spatial-imagery potentials, (Lord, 1984).

At the end of the semester all the students were given written and lab practical final exams. A statistically higher average was noted in achievement on the laboratory final for the experimental population while no significant difference was found for any group on the written final (primarily objective in nature). When a statistical analysis was performed on the final grades for the course, there was no significant difference found between any of the groups.

The study reveals, therefore, that the final evaluative procedures for the College Biology course in question are based heavily on verbal and analytical measures. The practical applicability, perceptual imagery potentials and manipulative skill are given little or no consideration in the final evaluation of the student.

The Rule-Assessment Technique: Determining Students' Strategic Knowledge

David P. Maloney
Creighton University
Omaha, NE

This session will be an introduction to the rule-assessment technique of Siegler (1976). The basic thesis of this technique is that subjects, of any age and background, use definite strategies in working science tasks, and that the differences among individuals will be found in the sophistication of the strategies they use. (The terms rules and strategies will be considered synonymous here.) Our studies using the rule-assessment technique have shown that students, even novice students who have received little or no instruction in a topic, do use definite strategies in working problems. In addition the same strategies recur with similar frequencies in different classes of the same course, and, in some cases, noticeable percentages of the students employ the same strategy after instruction as before. The basic details of the rule-assessment technique will be presented in the context of designing a paper and pencil task to determine students' strategies on a specific problem. Two different types of paper and pencil tasks will be described. The major portion of the session will be devoted to actually constructing one instrument. In addition copies of existing task sets will be available for participants.

Preparing a Grant Application: Do You Really Have to Follow Directions?

Dr. Harold T. McKone
Saint Joseph College
West Hartford, CT

The author recently completed a five month internship in the Extramural Associates Program at the National Institutes of Health (NIH). One of the major purposes of this experience was to obtain extensive knowledge of the grants preparation and peer review processes both at NIH and at other Federal funding agencies. Some of the helpful hints that were obtained from this in-depth exposure to the mysterious world of grantsmanship will be outlined.

Managing the Mastery-Based, Individualized Laboratory

William J. Mullin
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Fredericton, New Brunswick, Canada

Mastery and individualization are often reported to put extra demand on instructor time and facilities. The laboratory setting creates additional management problems. This paper describes several management strategies which were developed, in conjunction with John Tidswell, to allow for efficient operation of an "Experimental and Laboratory Techniques" course for 85 biology majors. Management strategies include instructor-set pacing and chit feedback, advance sign-up, and supplies request systems. These strategies allow for manageable instructor time, good control over inventory and precisely-defined responsibilities for everyone while retaining the advantages of individualization and mastery.

The Hay Infusion: A Unified Series of Laboratory Exercises in Freshman Botany.

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Jan W. Balling
California University of Pennsylvania
California, PA

John A. Novak
Ohio State University
Columbus, OH

At the beginning of the semester, each student in freshman botany at California University of Pennsylvania inoculates his/her own sterile hay infusion with garden soil. This provides each student with a miniature ecosystem in which communities of microorganisms undergo succession in well-defined seral stages. The hay infusion is studied during each laboratory period after inoculation. The pioneer organisms, several genera of soil bacteria, are studied by means of the Gram stain and transfer to differential solid media. Fungi are transferred to corn meal agar so that they might be identified. "Algae", index organisms of the climax community, are usually blue-green bacteria, green algae or diatoms. The algae are identified by means of simple keys. Several abiotic factors are also studied. Students must record their observations in a laboratory notebook. At the end of the semester, each student is required to write a term paper, in scientific format, on his/her own hay infusion.

Developing a Curriculum for Scientific and Technological Literacy: A Progress Report.

Dr. James J. Murphy
Iona College
New Rochelle, NY

An ambitious curriculum development effort to structure the core curriculum experience in science and technology for Iona College students has been carried on over the past several years. The Spring semester of 1984 marked the beginning of large-scale implementation of this curriculum. The effort has been instrumental in bringing about a significant qualitative change in the atmosphere of the college.

Following a brief overview of the structure of the Iona Scientific and Technological Literacy (STL) curriculum one specific example of course content will be described to illustrate how both science and technology are addressed within the thematically structured curriculum. The example centers on a problem-solving strategy which might be called "changing inadequate solutions". Finally some student reactions to the STL experience and some campus activities attendant upon the STL effort will be described. Of special note among the latter is the Science and Technology Fellows Program, a faculty enrichment and curriculum development program of great potential.

Interactions of Microscopic Soil Organisms: A Laboratory Exercise for Life Science Students

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Worcester State College
Worcester, MA

R.P. Esser
Florida Department of Agriculture
Gainesville, FL

Soil is inhabited by countless numbers of amoebae, nematodes, fungi, arthropods, bacteria and viruses. In most general biology laboratory courses, interactions among these soil organisms is ignored. We describe a simple, yet effective laboratory exercise which allows students to observe live interactions between fungi and microscopic animals such as amoebae, nematodes, and rotifers. Zoophagous fungi, common in soils, capture their prey by developing a variety of structural and behavioral adaptations such as sticky spores or hyphae, or forming constricting and non-constricting rings. The technique involves incubating a concentrate of extracted soil organisms in plastic dishes containing 1% water agar. Observations can begin within 24 hr and may be continued for several months at times convenient to the students. Students can keep logs and interaction maps of changes occurring to organisms in the agar. We believe that such observations will stimulate student interest in biology and will make them aware that soil is a biologically active environment. This laboratory exercise represents a departure from the past teaching methods wherein biology students study preserved specimens.

Physical Science for Business Majors

James Phillips, William Rybolt and Lance Heiko
Babson College
Babson Park, MA

Students entering business colleges have an orientation towards management of human or financial resources and generally view science as not relevant to their business training. However, science is both a liberal art and an essential part of modern business. Our challenge is to educate these future corporate leaders so that they understand how science influences business, and can deal with the problems resulting from the rapid pace of technological innovation effectively, based on a fundamental knowledge of science and the scientific method.

Our introductory course in physical science therefore includes numerous practical business-oriented materials in lecture and lab. We use articles from business publications and business school cases that show the relationship between science and business. For example, some describe how companies lost hundreds of millions of dollars because they didn't utilize the scientific method in their management decision-making. Other cases document the kinds of major research and development decisions involving science and technology American companies face today. Students also perform some experiments that have an economic factor, such as quantitatively comparing qualities and costs of commercial products. These kinds of practical cases and experiments are also applicable to other introductory courses where students may be equally antiscience.

Teach Them Reasoning Not Algorithms

John A. Ricketts
DePauw University
Greencastle, IN

Abstract and analytical reasoning skills are essential tools for the mastery of chemistry; in the Piagetian sense formal reasoning is required. Many of the entering college students cognitively operate at the concrete level. In order to create an environment that encourages cognitive development, the teacher must be aware of the capabilities of his beginning classes. The use of Piagetian puzzles can afford such an assessment. Using the Frog Puzzle which measures proportional reasoning abilities and the Maelworm Puzzle which measures propositional reasoning, it was discovered that 43% of the students in the introductory chemistry classes could neither reason proportionally nor isolate relevant variables.

Self-regulation is the important process within the Piagetian model for cognitive development. The laboratory component of the chemistry course can be cast into a Learning Cycle format to encourage disequilibrium followed by accomodation. Four Learning Cycles, The Chemical Dilemma (combinatorial reasoning), Inductive Reasoning from Chemical Experiment (combinatorial and propositional reasoning), The Plot Thickens (graphical interpretation), and The Great Titration Mystery (proportional and propositional reasoning) will be discussed and demonstrated. Their effect on the cognitive development of one high school chemistry class will be reviewed.

A Syllabus for the One Semester Chemistry Course for Health Professions

Jerry L. Sarquis
Miami University
Oxford, OH

In 1979, the Division of Chemical Education authorized the Task Force on Chemical Education for Health Professionals and, in 1983, its status was changed to that of a Committee. One of the goals of the Task Force was to design a syllabus for a one semester course in chemistry for students who will enter the health professions; this goal has been accomplished. This syllabus is presented by the Committee as a model to our colleagues. We believe it can be of assistance if used as a guide by an innovative professor, but in no way is it intended to dictate course content. In outline form, the syllabus indicates topics that we believe need to be covered and suggests relevant applications for many of these topics.

The Committee members are educators who have taught such a course in a variety of academic environments. The Committee also sought and received information and advice from professors in the health professions during the development of this syllabus.

Data-base Computer Program: Learning Data Analysis in an Ongoing Undergraduate Research Project

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Mount Mary College
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Data collection and analysis are an integral part of the research experience. Data collection can be done routinely. However, a special approach is needed to provide a data analysis experience in an ongoing research project where data is complex and collected over a period of years. Super-Base 64, a computer data base program, provided the vehicle to select discreet portions of data for individual students to perform data analysis. This paper reports on the process and specific cases where students were provided with selected references and sorted data. The overall longterm problem under study was: "The patterns of bacterial isolates and their antibiotic sensitivities in diseased and normal captive reptiles at the Milwaukee County Zoo."

Examples of selected problems were: "Normal flora of captive venomous snakes", "Antibiotic sensitivity patterns of three experimental antibiotics on normal flora isolates in captive reptiles", and "A comparison of the normal flora of two families of captive snakes Boidae and Columbridae.

For each of the mini-problems the students were asked to follow three basic steps to accomplish data analysis:

1. Assemble data into charts and graphs.
2. Discuss the data in view of the previous studies cited in the literature.
3. Draw conclusions based on data analysis.

The results of the students work and conclusions will also be presented.

History of Science as a Tool in Teaching Science to Non-Science Majors

Richard J. Seltin
Michigan State University
East Lansing, MI

The history of science has been used in courses for non-science majors in the past simply as a means for teaching history for history's sake. This is wrong. It will likely turn off what interest a student has in the nature of science. History is best used as a tool to illustrate the development of explanations of nature, the structure of science and how science and society interact. Using historical examples has several advantages: they are usually simpler to understand than are modern cases; understanding is not so much influenced by existing prejudices; and they have a continuity often missing in modern examples. The organization of three general education science courses taught at Michigan State is used to exemplify how history may be used as a tool in different ways. One of these courses uses materials from the physical sciences, one uses biological materials, and the third uses geology and evolution as vehicles to give students an understanding of the nature, structure and operation of science.

Laboratory Computers--How Should They Be Used?

Dr. Fred Thomas & Dr. Conrade Hinds
Sinclair Community College
Dayton, OH

Physics students at Sinclair Community College work frequently with inexpensive microcomputers, particularly for data collection and preliminary data analysis on air-track experiments. The techniques are much less tedious and more powerful than spark timers or conventional photogates, and provide the instructor with considerable new freedom to decide just how much--or how little--the students should be asked to do for themselves. One group, for example, can be given an almost instant table of velocities and times for use in plotting an acceleration graph, while another group can be guided to write the data analysis programs for themselves. More intricate possibilities include the students' developing computer models of the laboratory systems they are investigating.

As incoming students become increasingly computer-literate and as powerful laboratory hardware becomes increasingly available, it is essential for science educators to reevaluate the types of laboratory experiences we provide. Various alternative approaches will be demonstrated and discussed.

Alverno's Assessment Model as Applied to the Sciences.

Dr. Leona Truchan, Wendell Kringen, George Gurria
Alverno College
Milwaukee, WI

The Alverno College faculty has designed a curriculum and assessment process to assist students to develop and demonstrate ability in a variety of competences. Faculty, individually and as a group, design assessment instruments which then come under the scrutiny of other faculty in a continuous process of review and redefinition. This evaluation and revision process stimulates evaluation and revision of the instruments in a systematic way.

Validating assessment instruments is an unusual goal for a college faculty to pursue. To validate means that concepts of the abilities or competences assessed and the means for doing so must be carefully thought out, subjected to rigorous reasoning, and constantly reviewed against student performance outcomes. Developing and making explicit the criteria for assessment is a faculty effort to define these abilities and make them operational. Thus, faculty create criteria or descriptive statements that give themselves and students a picture of the ability to be assessed. Abilities are then inferred from performance. The students, the faculty, and external assessors from the Milwaukee professional and business community use these criteria to evaluate students' strengths and weaknesses in performance situations.

The three goals of this workshop are:

- to explain the Alverno Assessment model
- to give several concrete examples of assessment taken from the introductory integrated sciences courses and courses for majors in biology and chemistry and
- to present results from a seven year longitudinal study explaining the three independent approaches to measuring the meaning and development of the broad abilities the Alverno curriculum is expected to foster.

Final Exam Grades and Order of Exam Administration

Dr. Charles R. Ward
University of North Carolina at Wilmington
Wilmington, NC

Many college and university courses experience enrollment pressures that necessitate offering the courses in multiple sections. In some cases each section is taught as a separate course having different instructors, textbooks, and assignments. In other instances an effort is made to standardize the material presented in each section, including exams, to minimize intersection differences. In the latter case the order of administering hourly exams can usually be controlled. However, during the final exam period, exam sequencing is usually determined by a university-wide schedule. Conventional wisdom would indicate that sections taking the final exam early in the exam period would have less time to study for the test and therefore have lower test scores than those taking it later. We have found the reverse to be true. Potential consequences of this effect will be discussed and the results of student interviews will be presented to explain the phenomena.

Physics Demonstrations

Jerry D. Wilson
Lander College
Greenwood, SC

Lecture demonstrations bring scientific principles alive and arouse student interest. Going beyond the classroom, such demonstrations can be used in presentations designed to promote an interest in science for elementary and secondary students, civic groups, and the general public. This is evidenced by having given over 30 requested presentations last year. A typical presentation of a variety of physics demonstrations will be given for SCST/NSTA members wishing to attend.

Practical Methods for Training College Science Tutors and TA's-- A "Make-and-Take" Workshop.

John T. Wilson
University of Iowa
Iowa City, Iowa

Tutors and TA's continue to provide important instructional services in most college science courses. They must make many decisions concerning the "WHAT" and "HOW" of teaching in order to effectively promote student learning. They generally do all this without any special training or formal supervision. This workshop addresses this need and presents a practical, on-the-job approach for training TA's and tutors through supervision in a time effective manner. The materials and procedures to be presented are based on methods in use for over 6 years at the University of Iowa to train science and math tutors and TA's.

Two general areas will be of interest in this workshop. The first is HOW tutors and TA's can help students, particularly in learning to solve problems, improving study habits and test scores and in getting more out of lectures, discussions, and laboratory activities. The second area includes the skills and methods supervisors can use to work with tutors. Workshop activities will include reviewing research and ideas that "make a difference," practicing various conferencing skills using videotaped samples of tutors and TA's teaching, and developing a personal plan for on-the-job training for participants to use at their own institution.

The workshop will be appropriate not only for college staffs and faculty, but also those in supervisory positions in the public schools.

Guided Design: A Right Way to Teach an Interdisciplinary Course

David MacInnes, Jr.
Guilford College
Greensboro, NC

How can one teach an interdisciplinary course on the ocean without team teaching (expensive in faculty time) or bringing in many guest lecturers (too superficial and without a natural flow to the material)? By using Guided Design techniques in which students work in groups to solve particular problems or confront issues. Both breadth and depth are met by choosing questions or problems whose solution requires knowledge and skills from many disciplines. The topic I used was the interactions among the ocean, our society , and the individual. While learning the material, students also work on parallel projects where they engage in library research, original work and/or confront the major issues involving our use of the ocean today.

A Comparison of UNCW's New Chemistry Program for BSN Students to Its Former Chemistry Protgram for ADN Students

Sybil K. Miller
University of North Carolina - Wilmington
Wilmington, NC

The University of North Carolina at Wilmington (UNCW) is in the process of converting its two year Associate Degree in Nursing (ADN) program to a four year Bachelor of Science in Nursing (BSN) program. The Department of Chemical and Physical Sciences at UNCW is concurrently converting its one semester chemistry course taught for the ADN program into a two semester sequence of courses, including general, organic, and biological chemistry for the BSN program. This study will investigate the differences between the ADN chemistry program and BSN chemistry program at UNCW. Special attention will be focused on lecture topics covered, laboratory experiments carried out, testing devices used, math skills required, and the different goals and objectives of the two programs.

Process Skills: Foundation for Meaningful Learning

Susan C. Nurrenbern
University of Wisconsin - Stout
Menomonie, WI

The characteristics of poor problem solvers in beginning science courses have been well documented during the recent decades. The challenge of dealing with poor problem solbin skills still faces every science classroom teacher. Most remediation programs focus on math and/or reading comprehension skills. Classroom data suggests, however, that the difficulties exhibited in problem solving by novices is more deeply rooted, i.e., students are deficient in process skills. An examination of instructional materials, commercial products included, reveals a format that may actually inhibit the development of these processes.

Math SAT Scores vs. Chemistry Grades: Are the Correlations Really That High?

Charles R. Ward
University of North Carolina - Wilmington
Wilmington, NC

Over the past ten years, several studies have reported the correlation between SAT math scores and first-year college chemistry grades. The extent of the reported correlation varies from a low of 0.32 to a high of "nearly perfect". The wide variation in the correlation seems to be the result of several factors: (1) type of chemistry class being observed, (2) improper statistical techniques. A four-year study of General Chemistry classes at UNC-W shows a low ($r < 0.35$) correlation between SAT(M) scores and first-semester college chemistry grades. The correlation drops even lower ($r < 0.30$) for second-semester students. This study will be described along with a discussion of the inadequacies in several previous reports.

Individualized Instruction in Chemistry

Dr. William R. Bartlett
Fort Lewis College
Durango, CO

The excitement of learning chemistry lies in the sudden flashes of understanding and discovery that occur in the process of studying the subject, particularly in the laboratory. All students are able to experience the discovery process more frequently if they are given the opportunity to develop individual projects once they have learned fundamental concepts and techniques. Examples of individualized projects will be given from laboratory courses in organic chemistry, natural products chemistry, advanced synthesis techniques, and other advanced laboratories in the chemistry department at Fort Lewis College. The objectives and methods of operating laboratories which emphasize individualized projects will be discussed along with the observed benefits of such experiences to our chemistry students.

College Physics: The Radiometer Revisited

Dr. Clarence H. Cooper
University of Texas at El Paso
El Paso, TX

The standard textbook explanation of the radiometer is reexamined. Experimental data showing the behavior of the radiometer as a function of pressure is presented along with a tentative explanation.

Can the Computer Teach Science?

Dr. James M. Espinosa
Texas Woman's Universly
Denton, TX

Teaching science is very difficult; if we assume, as I do, that teaching involves student learning, not simply the physical process of lecturing in front of a class of students. Student learning involves additions to the behavior repertoire of the student. It could involve scientific terms being used at the appropriate opportunities, but mostly the solution of problems: learning to think scientifically. The process a student must follow for effective learning is a slow one, involving many small steps. A one-to-one professor-student relationship over periods of hours a week can produce significant learning with a good professor. But this is an impossible situation because of the number of students typically in a classroom and because of the tiring repetitiveness involved even with a single sudent. But a good computer program can slowly shape new behavior in the student, what we call learning, and it can service students individually and also many students over time. Once the program has been perfected the computer can definitely be used to teach science far better than a professor can now.

Microbial Identification Using a Computer Data Base System

Dr. Margaret E. Helmbrook
University of Northern Colorado
Greeley, CO

Storing bacterial characteristics in a computer data base makes this information readily available to students who are otherwise limited to large and expensive taxonomic keys. The process of identification can be divided into stages simulating the choices bacteriologists must make at the bench, or all available data can be entered to make comparisons with known species. Data bases may be searched on any combination of characteristics with equal or differing weights attached to individual characters. Identification of the organism is based on a numerical value which represents a % similarity to known species. Bacterial species names are printed so that students can verify the identification by reading the corresponding taxonomic descriptions.

Changing Attitudes in the Science Lab Using Computers

Dr. Jim LaVelle
University of Southern Colorado
Pueblo, CO

Most college and high school microcomputer applications have been directed toward "computer laboratories" where programming and computer literacy has been emphasized. This paper outlines some applications of microcomputer workstations in the Science Laboratory which are designed to change this focus toward using the microcomputer as a tool for studying science. Using commercial software, interfacing hardware, and existing laboratory equipment, students and teachers may focus more of their efforts upon the design of experiments and analysis of results rather than on the process of data gathering. Simulation, information management, telecommunications, networking, graphics, interactive tutoring, word processing, data base, and spread sheet applications are integrated into the curriculum. An optical laser disk coupled with an Apple IIe microcomputer will be demonstrated as one example of a biological work station. This paper resulted from a project funded by the Apple Education Foundation at the University of Southern Colorado and Central High School in Pueblo, Colorado.

Use of the Computer in Introductory College Physics Labs

Dr. Paul Lightsey
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The availability of low-cost microcomputers provides the opportunity to inexpensively develop computer controlled instrumentation. Interface circuitry and techniques that can be used with appropriate transducers to provide instrumentation for timing, thermometry, photometry, coulombmetry, goniometry, dynamometry, and others will be presented. Microcomputers used in these applications have included the Apple II, Commodore 64, Timex/Sinclair 1000, and Timex/Sinclair 2068. Opinions on appropriate pedagogic strategies for utilizing these technologies in the introductory laboratory will be discussed.

A College Environmental Biology Curriculum: Making Use of the Local Area

Dr. Preston Somers
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Environmental Biology Curricula are desirable inclusions in the degree offerings of college biology departments. Biology departments of colleges located in the Rocky Mountains should seriously consider adopting such curricula because of the wide variety of habitats available to them and because of the need for greater understanding among their students of the environmental problems of their area.

The Environmental Biology curriculum at Fort Lewis College can be considered a model for such curricula at small colleges in the Rocky Mountains. After three introductory biology courses, students start in their sophomore year with a course in the principles of ecology that includes extensive field and laboratory experience. In addition to other classroom biology courses the students take three field oriented summer courses: one covers the principles of plant systematics as well as the local flora, the second is an extensive review of the local vertebrates, and the third is a senior level, capstone course in ecological field experience, inventory techniques, and environmental measurement.

New Technologies in Individual Instruction in College Science Teaching

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The electronic revolution continues to have a great impact on our daily lives. The marketplace is filled with all kinds of gadgets, games, and toys which have been brought about by the miniaturization of electronic circuits. We and our children have been entertained many hours by these devices, but few of us have analyzed the educational impact of the electronic revolution.

How can microcomputers be used in the classroom, in the laboratory, in research, in learning theory, or more importantly, the learning process? What are the possibilities of the marriage between the microcomputers and the videosystems in individualized instruction.

Have you ever heard of intelligent videodiscs? Imagine a device that holds the equivalent of 54,000 slides, any one of which can be accessed within five seconds. Imagine also that the same device can play up to a half hour of a motion picture and that the motion sequence can be selected and displayed in forward, reverse, and/or at different rates of speed. All of this capability is on one side of a videodisc. Flip the disc over or change the laser beam or stylus and you have doubled the capacity. Now add two tracks of sound on each side, couple this with computer technology and the potential for such a device in education is staggering.